LA-UR-01-6670
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Title: **A Data Automation System At Los Alamos National Laboratory**

Author(s): Stephen Betts, Connie Schneider, Mark Pickrell

Submitted To: 8th Environmental Management Nondestructive Assay Characterization Conference

Los Alamos
NATIONAL LABORATORY

LA-UR-01-6670

A Data Automation System at Los Alamos National Laboratory

Stephen Betts, Connie Schneider, Mark Pickrell
Los Alamos National Laboratory
P.O. Box 1663
Los Alamos NM, 87544
stephen.betts@lanl.gov, cschneider@lanl.gov, mpickrell@lanl.gov

ABSTRACT

Idaho National Engineering and Environmental Laboratory (INEEL) has developed an automated computer program, Data Review Expert System (DRXS), for reviewing non-destructive assay (NDA) data. DRXS significantly reduces the data review time needed to meet characterization requirements for the Waste Isolation Pilot Plant (WIPP). Los Alamos National Laboratory (LANL) is in the process of developing a computer program, Software System Logic for Intelligent Certification (SSLIC), to automate other tasks associated with characterization of Transuranic Waste (TRU) samples. LANL has incorporated a version of DRXS specific to LANL's isotopic data into SSLIC. This version of SSLIC was audited by the National Transuranic Program on October, 24, 2001. This paper will present the results of the audit, and discuss future plans for SSLIC including the integration on the INEEL-LANL developed Rule Editor.

1. INTRODUCTION

The Department of Energy (DOE) has determined that transuranic (TRU) waste generated by DOE programs will be stored at the Waste Isolation Pilot Plant (WIPP). The WIPP Waste Acceptance Criteria (WAC)[1] and the Quality Assurance Program Document (QAPD)[2] govern the characterization and certification requirements for TRU waste destined for WIPP. Like other DOE sites, Los Alamos National Laboratory (LANL) generates TRU waste, which is intended to be shipped to WIPP.

The Transuranic Characterization Program (TWCP) at Los Alamos National Laboratory is responsible for the characterization and certification of LANL's TRU waste. To support this mission LANL operates multiple nuclear facilities, characterization systems, and a quality assurance program. Waste containers must be characterized by Real Time Radiography

(RTR), Non-Destructive Assay (NDA), Head space Gase (HGAS), and occasionally by Visual Examination (VE). Results from these characterization processes must undergo intense data-validation to meet the WIPP certification requirement, resulting in significant cost. A study was conducted at LANL to determine the average cost of for all characterization and certification processes of each TRU waste stream. The study showed that data-validation is one of the largest contributing elements to the characterization cost for a sample shipped to WIPP.

To conduct the characterization processes needed for WIPP, LANL maintains a suite of characterization systems, some mobile and others housed in fixed facilities. Currently, drums are stored at a central storage facility, and shipped to two other locations where characterization and packaging activities are performed. Each facility has a maximum limit for the amount of nuclear and/or hazardous material, as well as the total number of containers which can be on site at any one time. The facility limits introduce the need to transmit samples in limited quantities, allowing characterization or packaging to be performed only on the samples present at a given facility, which can generate inherent in-efficiencies in the process. An improved process for tracking sample status at all locations and scheduling movement of samples between facilities is needed to optimize resources.

2. APPROACH

LANL is in the processes of addressing the data-automation and process controls that will optimize the characterization and certification process at LANL. In addition, some of the improvements discussed in this paper are directly applicable to all DOE sites as well as private contractors who perform data reviews for WIPP. While a number of process

improvements are underway at LANL, this paper will focus on those directly related to the performance of NDA work.

2.1 Software System Logic for Intelligent Certification (SSLIC)

LANL has developed a software package called Software System Logic for Intelligent Certification (SSLIC), which is intended to do overall process control for all aspects of NDA work including, facility inventory control, electronic logbooks, and data review. The data review is being conducted by the Data Review Expert System (DRXS), developed by the Idaho National Engineering and Environmental Laboratory (INEEL). To date, SSLIC has been developed to generate data packages, and then call DRXS to review data-packages. This software package was audited in October 2001, by the Carlsbad Area Office (CAO) and determined to meet all requirements for WIPP use. SSLIC is currently in production at LANL, and has performed automated reviews on all isotopic data generated since October 1, 2001.

2.2 History of data automation at LANL

In June of 2000, LANL initiated discussions with INEEL to modify their existing DRXS system to review data at LANL using the existing approved review process in place at LANL. The intent was to modify DRXS in stages, adding in reviews for one NDA system each stage, with the first stage to automate the review of isotopic data. The data review process, for this approach, is shown in Figure 1. A rule file for each method and data parsing routine would be generated by INEEL. The DRXS code

then reads raw data files and the rule file to perform the review, and generates review results. This method would require a number of code updates, and therefore, many changes to the software quality assurance (SQA) documentation.

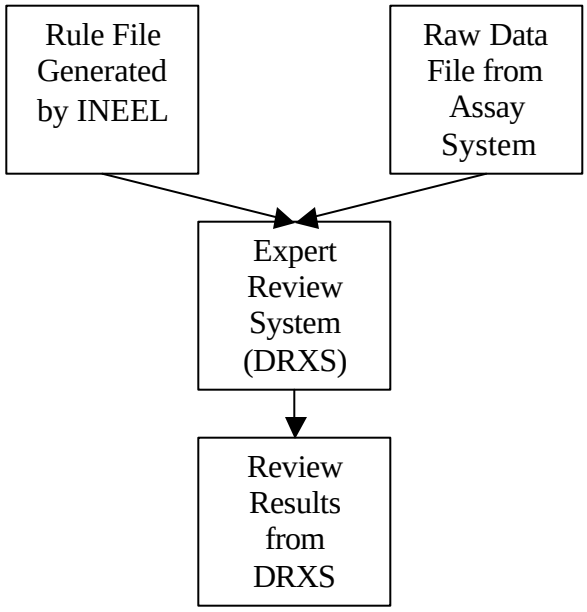

Figure 1: Initial Data Review Method

Close to the end of the first stage, INEEL personnel discussed the concept of a generalized rule editor, which at that time was in an early prototype stage. The generalized rule editor would allow any end user to generate their own review rule file, parsing information, and reporting information (see Figure 2). The generalized rule editor and DRXS could then be validated once through the SQA process, since they would not change. The end-user would only have to validate the specific rules needed at the site, and would have the ability to modify rules as necessary. This process significantly reduces the time needed for validation of the computer code to

WIPP requirements. Furthermore, the process can easily be applied to many characterization methods as long as the raw data is available in a common text file format. It was clear that this process would provide a better product to LANL as well as the DOE complex. Therefore, LANL and INEEL completed work on the isotopic data review, and then redirected efforts to complete the rule editor instead of completed automated reviews for the rest of LANL's NDA systems.

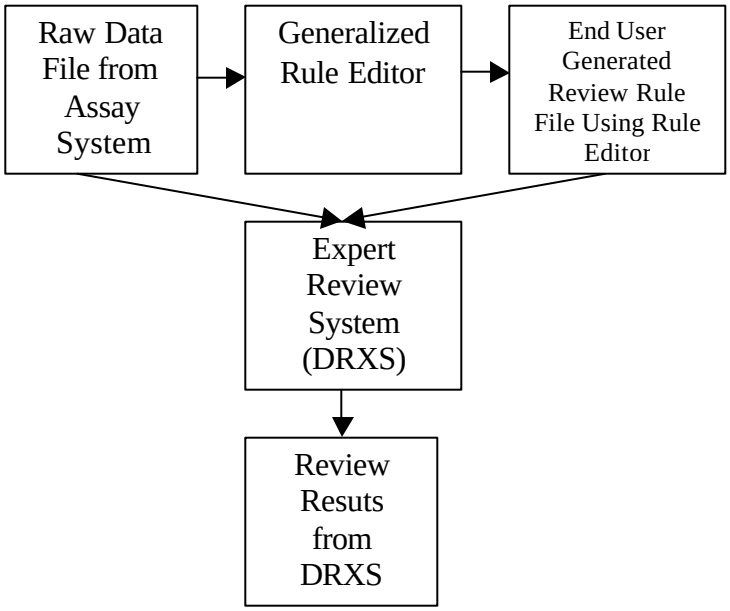

Figure 2: Data Review Method Using Generalized Rule Editor

At this time the requirements for the generalized rule editor are complete, and a working prototype is being tested at LANL and INEEL. LANL intends to incorporate the use of the rule editor into the data review process and have it audited by CAO in February 2002.

2.3 Improvements realized from use of SSLIC-DRXS

The automated review system has been used to review all isotopic data generated since October 1, 2001. Manual reviews required ~ 12 person hours to complete per

data package, and an elapsed time, from start to completion of data-generation-level review, of 1 week. The average time to complete an automated review has been ~1.5 hours per data-package with in elapsed time of 1 day. The result if a factor of 8 reduction of personnel time, and a factor of 5 reduction in completion time.

3. FUTURE WORK

3.1 Automate review of all NDA systems using the Rule Editor

We intend to continue collaborations with INEEL to complete the Rule Editor and have it audited by CAO in February 2002. At the time of the audit we will have rules developed for our isotopic systems and our High Efficiency Neutron (HENC) assay system. After the audit, we will continue to use the Rule Editor to develop review rules for the remaining NDA systems. Reviews for all NDA systems will be in production by the end of fiscal year 2002.

3.2 Additions to SSLIC for process control in fiscal year 2002

In fiscal year 2002 features will be added to SSLIC to improve both data review and process control functions. At this time SSLIC controls part of the data review process. A key missing element is an electronic logbook feature. Currently, operators record all calibrations, system checks, background measurements, and sample assays using paper logbooks. The logbooks and database entries must still be reviewed by a human to determine that entries match, and therefore no transcription errors were made. In fact, this review constitutes a good fraction of

the time to review the automated reviews. An electronic logbook will be generated to allow the operator to make all entries directly into the database as well and meet all data recording requirement. Assay dates and system id's will be entered by the computer automatically, and sample numbers will be scanned using a bar code reader. These features will significantly reduce the possibility of entry errors and will eliminate the possibility of transcription errors.

The primary process control feature that will be added to SSLIC in fiscal year 2002 is a facility inventory control function. A process is in place to control and track the nuclear inventory at each facility. The process, however, is very difficult to use, and does not easily allow for sharing information between multiple facilities or between the facility and the NDA team. A module will be added to SSLIC which will significantly simplify the inventory control process, while still providing all the existing functionality, as well as the additional functionality of sharing information between multiple facilities and multiple processes.

4. CONCLUSIONS

LANL has developed a computer code to provide for overall process control of NDA, including facility inventory control, electronic logbooks and data review. The data review is conducted by the Data Review Expert System (DRXS), developed by the Idaho National Engineering and Environmental Laboratory (INEEL). The combined SSLIC-DRXS is in production use at LANL for reviewing isotopic data, and has reduced, on average, the personnel time for data package generation by a factor of 8.

INEEL and LANL are working together to implement a generalized rule editing system which will allow an end user to define their own review process. The systems allow the user to specify data parsing information, data review information, as well as report formats. The system is not specific to any particular assay system or facility and therefore can be used by any DOE site or private company to review NDA data. Enhancements will be added to SSLIC to improve the facility inventory control and data-review processes.

AKNOWLEDGMENTS

This work was funded by the following organizations: the U.S. Department of Energy, Environmental Management and Defense Programs, and the Mixed Waste Focus Area, Idaho National Engineering and Environmental Laboratory.

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